Project Overview:

Led by the University of Alaska Fairbanks, this 4-year project focuses on the integrated cultivation and harvest system design of kelp farms with the goal to increase efficiency and/or reduce costs. This project was funded by the U.S. Dept. of Energy (DOE), Advanced Research Projects Agency-Energy (ARPA-E) which is interested in the scalable production of macroalgae for potential future use as a biofuel.

The intent of this project was to design replicable farms that are cost-effective systems for growing sugar kelp. Through innovative technology and practical solutions, the project team's objective was to reduce costs associated with kelp farming at the test site in Kodiak, Alaska.

Funding source:

U.S. Department of Energy
Advanced Research Projects Agency-Energy (ARPA-E)
Macroalgae Research Inspiring Novel Energy Resources (MARINER)

The first outplanting at the Kodiak farm site took place in the fall of 2019. Since then, the CAT-1 team has integrated what it's learned into expanding the farm and management techniques! The farm system is a catenary array, designed by C.A Goudey & Associates and the entire farm was fabricated by TendOcean™ LLC of Newburyport, MA and transported to Kodiak by barge and truck. The array is a pair of 150'-wide catenary modules that is supported by ten anchors. Learn more about the catenary array design at the Kodiak farm on the next page!

Partners make this project possible:

University of Alaska
Principal Investigator: Dr. Michael Stekoll, UAF

Woods Hole Oceanographic Institute

Blue Evolution

Kodiak Island Sustainable Seaweed

Alaska Ocean Farms

TendOcean™ LLC

C.A. Goudey & Associates

GreenWave

Alaska Fisheries Development Foundation

F/V Savage

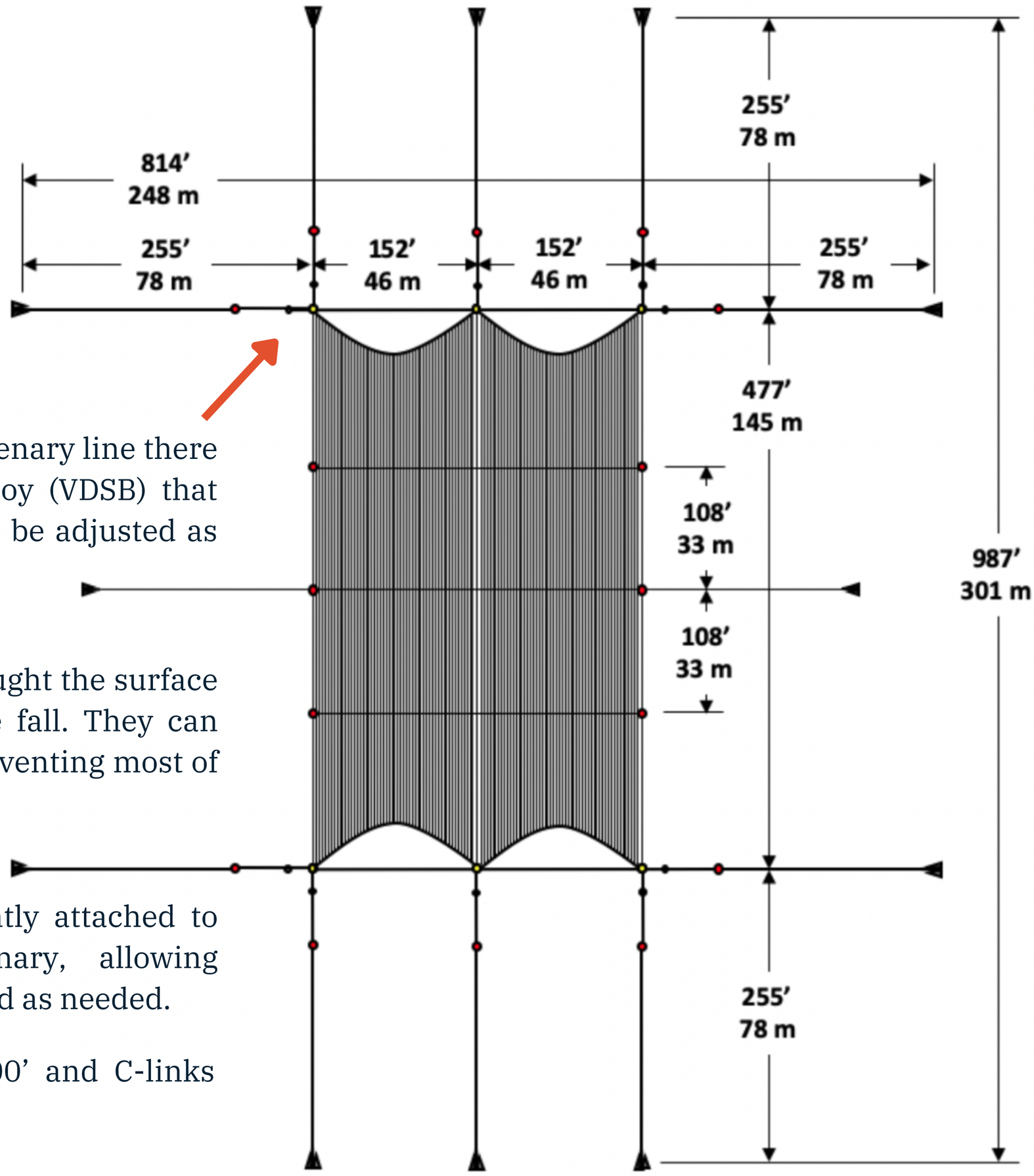
Kelson Marine

University of Connecticut

The Catenary Array

In the first year of the project, both array modules supported 200’ growlines. One incorporated 5-line spreader bars with lines 2.5’ apart and the other module had individual growlines spaced 2.7’ apart. In year two, the farm length was increased to 400’. Intermediate support kept the growlines 7 feet from the surface.

The array is designed to maintain tension across a farm structure. The diagram below depicts the year-three design after the spreader bars were eliminated and replaced by set lines to accommodate the needed flotation along the growlines.



Where the anchor lines meet the catenary line there is a variable-displacement spar buoy (VDSB) that allows the depth of the growlines to be adjusted as needed.

VDSBs also allow the farm to be brought the surface during growline deployment in the fall. They can also be sunk as storms approach by venting most of their air.

Growline extensions are permanently attached to their positions along the catenary, allowing growlines to be inserted and removed as needed.

All growlines are measured to 200’ and C-links spliced into each end.

Pretension is needed to reduce growline sag between the set line flotation. Deadeye tensioners were added to each of the ten anchor lines to allow each to be adjusted as needed.

These tensioners operate as a kind of underwater block and tackle! It allows for slack during seeding and harvest and proper tension during the growing season.

There is still more to come with this project. The fourth growing season (Fall 2022- Summer 2023) is underway and will provide further project results!

Thank you to Cliff Goudey and the project team for input and expertise!

Learn more about the project at https://arpa-e.energy.gov/